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Federal Imaging Market

1994

Federal Market Analysis Program

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Abstract

The use of imaging technology to support operations of the federal sector is increasing at an accelerating rate. This trend is based on a number of factors:

- Advances in imaging technology that make additional types of applications technically feasible and affordable
- Expanding capability of microprocessors that allow the downsizing of imaging technology to smaller computer platforms—e.g., from mainframes to midsize to desktop computers
- Pressure on agencies to reduce staff resources and find more cost-effective ways of delivering services
- The proactive policy of the Clinton administration to reduce paperwork through process re-engineering and expanded use of technology—i.e., "re-inventing government"

This report reviews how imaging technology is being implemented and what trends will affect its use in the future. This review is based on a recent survey of federal IRM executives, conducted to assess the current and planned use of imaging technology and to determine the perceived benefits and challenges associated with its use. The analysis of these findings provides an assessment of technology use and demand changes in the federal market and offers a forecast of trends and opportunities related to imaging technology.

Based on findings in a survey of federal IRM management, the most obvious benefit of implementing imaging technology is the savings associated with reduced labor cost and storage fees for paper files.

More generally, imaging is recognized as providing new ways to store, process and share information—not only for its primary users but for the electronic community at large.

To obtain these benefits, an increasing proportion of the IRM budget is being used to implement systems that employ imaging technology. The political trend to downsize and streamline government is a strong motivator for such change, and technology is viewed as a key enabler. From a strategic viewpoint, the use of imaging technology is a way to make government more efficient and to re-invent or re-engineer agency operations. The analysis performed for this report indicates that the IRM community is using imaging technology to support specific operations with payback in cost reductions of labor and document handling expenses.

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Analysis Program**

Federal Imaging Market—1994

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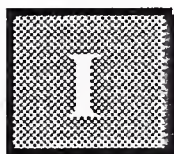
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Introduction

This report and the related research were performed as part of INPUT's Federal Systems and Services Market Program (FSSMP). This program supports leading vendors in the information services industry in developing and executing their strategies for pursuing business with the federal government.

The report contains a review of the current and projected use of imaging as a supporting technology of the information management systems in the federal sector. This review is based on a recent survey of federal IRM executives which was conducted to determine the current and planned use of imaging technology and the perceived benefits and challenges associated with its use.

This report has been written to provide vendors with a better understanding of the use of and needs associated with imaging technology to support government operations. The executive summary of the report has been provided to organizations in the federal sector that participated in the survey in order to acquaint them with the activities and perceptions of their counterparts in other agencies.

A Scope

This report examines use of imaging technology in the federal government. The focus of the report is on:

- Present and planned use of the technology in supporting information systems
- Perceived benefits of imaging technology

- Critical success factors and obstacles to the use of imaging technology
- Vendor opportunities to support the use of imaging technology and its supporting products and services

B**Objectives**

This report addresses the following issues:

- To what extent is imaging technology being used to support current systems implementations?
- What benefits does the federal community expect from the use of imaging technology?
- What benefits have been obtained through imaging technology implementations?
- What barriers exist to implementing imaging technology?
- What are the implications of these barriers to vendors of imaging technology and support services?
- How can vendors facilitate the implementation of their products and services?
- How will the use of imaging technology change in the next three to five years?
- What is the size of the imaging market and how will it expand over the next five years?
- What are the characteristics of new vendors and products entering the imaging market?

C**Definitions**

In its simplest form, imaging is defined as the capture, storage, retrieval and display of graphical representations of information.

Beginning with early optical character recognition (OCR) implementations, the antecedents of today's imaging technology,

imaging implementations have been used in the federal government for decades. Historically, as implied by its character orientation, imaging technology has been viewed as merely a means of converting data from one medium to another. Today, with the advances in graphical capabilities for users, imaging technology provides another context for presentation and processing of information.

Beyond this generic view of imaging technology, other terms referred to in this report are:

CALS:	Continuous Acquisition and Life-cycle Support program (formerly Computer-aided Acquisition and Logistics System)
GIS:	Geographic Information System
SDTS:	Spatial Data Transfer Standard (FIPS 123)

D

Methodology

This report was developed based on survey data collected from the management staff of selected departments and agencies of the federal government. Initial contact was made at the agency IRM executive level. In most instances, subsequent interviews were held with subordinate staff.

Interviews were structured, but discussion was allowed to range over issues related to the interviewee's knowledge of imaging technology and its application by the interviewee's agency. Information about each respondent's active and planned projects was solicited and discussed. As outlined in Chapter III, Survey Findings, survey participants were asked about their current and future information systems activities and whether imaging technology would be used. Relative to their own agency, participants were asked what benefits they perceived and/or had obtained in implementing imaging capabilities, and what they viewed as the critical factors and obstacles in such undertakings.

Participants were asked questions to determine how vendor products and services would be used to support their efforts in

developing and implementing imaging solutions. Finally, participants were asked to identify other issues or trends that they felt were significant to their use of imaging technology.

Tabulations of question responses are presented in Chapter III.

Two profiles of imaging applications from different agencies were developed to give perspective to the survey findings and to refine specific recommendations. A summary of information obtained is provided in Chapter IV.

In addition to the primary input from department and agency sources, the secondary sources of information for this report included the following:

- Interviews with vendors of imaging technology products and related services
- Interviews with standards organizations
- Non-proprietary insights from custom research and consulting studies
- Ongoing interaction with technical experts and practitioners
- INPUT's research library file on technologies, agencies and vendors

E

Report Structure

Following this Introduction chapter is an Executive Overview that provides an overview of imaging technology and how it is being used in current systems development activities. The Executive Overview also summarizes findings and recommendations given in greater detail in subsequent sections of the report.

The third chapter of the report, Survey Findings, relates specific information obtained from interviews with the departments and agencies of the federal government. These interviews were conducted to determine the use and significance of imaging in current and planned projects and to define contractor support needs.

Chapter IV, Profiles, relates the experiences of several agencies that have developed applications using imaging technology.

Chapter V, Findings and Recommendations, presents observations based on the survey findings, draws conclusions relative to the issues and needs of the federal marketplace, and offers recommendations to the vendor community.

The final section of the report, Market Forecast, estimates the size of the federal imaging market over the next five years and cites the types of products now in use and being introduced.

F

Related INPUT Reports

Federal Information Systems and Services Market, 1993-1998

Federal Information Systems and Services Market, 1994-1999

Federal Geographic Information Systems Market, 1991-1996

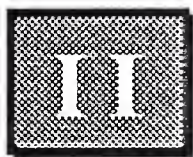
Service to the Citizen Market—1994

Object-Oriented Technologies in the Federal Market—1993

Client/Server Trends in the Federal Market—1994

Business Process Re-engineering in the Federal Government—1994

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Executive Overview

A

Management Perspective

The use of imaging technology to support federal applications is growing rapidly. IRM management recognizes that imaging investments will provide productivity benefits and improved operational economies through cost reductions in labor and storage expenses. The use of imaging is changing the character of many paper-intensive operations, dramatically increasing the timeliness and availability of information.

The projected use of imaging technology in the federal sector will grow from \$700 million in FY 1994 to almost \$2 billion by FY 1999 at a five-year compound annual growth rate of 21%. This compares to a 7% compound growth rate of the total contracted portion of the federal IT market. The total imaging market for the 10 year period 1993 to 2003 is expected to grow from \$2.5 billion to \$27 billion, at a CAGR of 30%. INPUT believes that no market can sustain this growth rate indefinitely. As imaging becomes more and more pervasive, it will eventually become difficult—and possibly unnecessary—to identify the imaging component of a system or application.

If the current trend continues, the civilian agencies will be spending close to 70% of the IT budget by FY 1998; the DoD will spend only 30%. It is reasonable to assume that the percent of total dollars spent on imaging will follow this same ratio.

The research of this report indicates that while cost savings is clearly an objective for the federal manager, the re-invention of government theme is a significant motivator. The use of imaging technology provides a way to re-engineer agency operations to lower operating costs and improve information availability. Fueled by continued government downsizing and ongoing cost

reduction pressure, it is likely that technological innovation will increase—and imaging will be at the forefront of cost reduction alternatives. Further, although government lags behind industry in the application of business process re-engineering, as this methodology finds its place in the federal sector its use will add momentum to imaging deployments.

The general findings of this report indicate that imaging is recognized as the means to support expanded information sharing. The expanding context of information sharing goes beyond the originating agency that collects and processes specific operational data, to other departments that comprise the growing federal electronic community. In this regard, the concepts of the information highway and open systems using off-the-shelf components are operationally relevant to IRM management.

Although much of the IRM focus on imaging technology relates to savings in paper handling, storage and retrieval costs, there is significant use of imaging for broader document and workflow management systems and for geographic information systems.

Although the prospect of using imaging is viewed optimistically, initial cost and management approval are considered significant start-up barriers. Operational issues include user acceptance and the network capacity needed to support information sharing. Technical support, a matter always associated with any new technology implementation, is also a concern.

Other findings of this report address:

- Competitive solutions must be based on open systems principles; low cost, user maintainable, off-the-shelf software solutions will be most competitive.
- Critical success factors for most imaging implementations focus on clear cost/benefit justification and return on investment.
- Desktop and department server configurations that can be integrated into existing agency networks provide more competitive advantage.

- Data access and interchange capabilities are important characteristics that enable agencies to reach beyond narrow operational needs and achieve broader information sharing goals.
- Agencies will need both technology and staffing support; vendors' support capabilities should address front-end consulting, project management, training and ongoing technical support.
- Program and technical management must be made aware of the relevant technical issues in order to ensure appropriate expectations and user involvement.
- User involvement from inception through completion of projects is necessary to resolve implementation and ongoing operational issues.

B

Today's Environment

As even the general public is aware, the economic forces at work in the federal sector have created a fiscal environment in which government downsizing and corresponding cost reductions have curtailed discretionary spending on new technology implementations. In particular, the curtailment of DoD spending, the primary source of new technology assessment and confirmation for many smaller civilian agencies, has served to further delay new IT initiatives.

The current pressure on government to do more with less and the increased competition for government programs does not foster an environment that encourages investment by either government or industry in new technology, particularly if there are significant start-up costs.

C

Imaging Capabilities

The findings of the survey conducted for this report indicate that most IRM managers are convinced that imaging technology will

benefit their operation and mission support in a number of significant ways. The following benefits were cited most often:

- Operational economies
- Improved workflow efficiency
- Improved data sharing and access
- Better information security and document control
- Improved information accuracy
- Elimination of other (document control) systems

By a wide margin, the benefit cited most frequently, as both expected and experienced, was operational economies. The focus on costs and cost reduction was consistently referred to by the participants in the study and reflects the issues facing agency and IRM executives today.

The reported success of imaging implementations was encouraging. A significant factor cited in the benefit of improved operational economies was that imaging implementations used and exploited the capability of installed desktop capabilities.

The leading responses to questions about critical success factors in implementing imaging included the following:

- Demonstrating and obtaining real cost/benefit payback
- Technical solutions providing ease of use
- Sufficient training
- Availability of necessary standards
- Consistency and integration into an enterprise architecture
- Acceptability of output media
- Document and information security
- Storage space savings

D

Matching Capabilities to Needs—The Vendor View

When offering any new product or service, the successful vendor must provide the functional capability and meet user needs at a competitive price. However, in introducing products or services using new technology, the vendor must be able to understand the obstacles the customer faces in adopting the technology. Appropriate vendor support is particularly critical to the customer's success, especially if the technology must be intimately understood by the user to gain its full benefit.

To be successful in such situations, leading vendors must help customers address their technology transfer needs and provide assistance in removing obstacles that customers face. The primary obstacles faced by IRM executives are enumerated below. Implicitly, as obstacles to adopting the technology these factors are also barriers to the acquisition and use of vendors' products and services.

The obstacles faced by federal users in implementing imaging solutions include:

- Funding constraints
- Lack of top management education and commitment
- Network limitations
- Need for user acceptance
- Training needs
- Concerns for document and information security
- Slow pace of standards development and adherence
- Complexity of imaging technology

E

Related Issues

The issues federal agencies face today have never been more diverse. Concerns range from agencies' own operational efficiency to the overall effectiveness of government. Relative to imaging, this study's survey identified IRM management concerns that include the following:

- National Performance Review/refocus on agency mission
- Federal downsizing and budgeting constraints
- Development of the information highway; network design and limitations
- System/network capacity, performance and reliability issues
- Data standardization
- Evolution to open systems
- Interagency data sharing and access
- General advance of electronic commerce
- Security of electronic information

In bringing technology solutions to the federal marketplace, vendors must understand these issues as both constraints and opportunities, and, where appropriate, relate their capabilities to the larger view of the IRM executive.



Survey Findings

Primary research surveys were conducted with participants from 11 agencies. This section summarizes survey participants' responses relative to:

- Each agency's current and planned use of imaging technology
- The scope and significance of imaging applications relative to overall information systems activity
- The use of imaging technology in support of efforts to re-engineer the business
- The integration of imaging systems with legacy operations
- The extent to which open systems principles are affecting the implementation of imaging technology
- The expected and experienced benefits of using imaging technology
- The expected and experienced disadvantages of using imaging technology
- The critical success factors in implementing imaging systems
- The obstacles to be overcome in implementing imaging systems
- The vendor support needed to implement imaging systems
- The degree to which commercial off-the-shelf software is being used to implement imaging systems

- The types of platforms in use and planned to support imaging systems
- The current/planned financial resources to be used for imaging efforts
- Other issues and trends that survey respondents considered relevant to the use of imaging technology in the federal sector

A

Use of Imaging Technology

Respondents were asked, *"To what degree is your agency currently using or planning to use imaging technology to support its operations?"*

Exhibit III-1 summarizes these responses; responses were categorized into one stage of development only.

Exhibit III-1

Imaging Activity

Stage of Development Activity	Percent of Respondents
No Use Planned	13
No Use Yet But Planning To	27
Implemented Some (1-4) Applications	47
Implemented Many (5 or more) Applications	13

Number of responding agencies = 15

This data shows that 67% of all surveyed agencies were engaged in some stage of imaging activity and 60% had implemented at least one significant application. Almost half (40%) of the respondents indicated no implementation to date. In the two agencies that indicated no use planned, a data reduction requirement exists, but funding for initial development could not be identified. All respondents indicated that the requirements for imaging would grow.

B**Scope and Significance of Imaging Technology**

To determine the significance of imaging technology relative to the direction of the agency, respondents were asked, *"In what areas of your operation do you feel imaging technology will be used?"*

1. limited to specific, narrow functional needs
2. broad functional/program needs
3. agencywide needs
4. interagency data sharing

The responses are as follows in Exhibit III-2. (Multiple responses were allowed).

Exhibit III-2

Scope of Imaging Implementation

Scope of Implementation	Percent of Applications Identified
Limited to Specific, Narrow Functional	35
Broad Functional/Program	26
Agencywide	26
Interagency	13

Number of applications = 23

Responses to this question indicate that imaging technology is being used to support application development across a broad implementation scope, from redevelopment of existing applications to the support of interagency undertakings. On a broad scale, imaged information is enabling the re-engineering of functions and how organizations operate. Even more significant is the implementation of systems to enable the sharing of information across agency boundaries.

Half of the agencies reported organization-wide application. Almost a third indicated a requirement to go beyond agency boundaries. Next, respondents were asked, *"How is/will your organization use imaging technology?"*

The responses are shown in Exhibit III-3 below. (Multiple responses were allowed).

Exhibit III-3

Significance of Imaging Applications

Process Re-engineering and Imaging Applications	Percent of Applications Identified
New Program Initiatives Only	5
Support of Current Functional Architecture	74
Re-engineering of Functional Areas	26

Number of applications = 19

The responses indicate that imaging technology is being used primarily to support current functional architecture. Cost/benefit concerns are mentioned frequently as motivators for imaging solutions, but insufficient funding for start-up appears to be limiting the use of imaging technologies. On a broader, cost-benefit scale, imaged information is enabling the re-engineering of functions and organizational procedures and the sharing of information across agency boundaries.

C

Types of Imaging Applications

Respondents were asked, "*What type(s) of imaging systems are/will be useful to your organization?*"

1. document storage/retrieval
2. workflow management
3. GIS (geographic information systems)
4. other

The responses were as follows in Exhibit III-4. (Multiple responses were allowed).

Exhibit III-4

Types of Imaging Systems

Type of System	Current Applications	Future Applications
Document storage/retrieval	8	11
Workflow management	1	4
GIS	4	6

Number of agencies responding = 14

The types of imaging systems most valued center on document management. The need for imaging to route data between processes for the purpose of providing an automated workflow environment is undeveloped now, but is possible for future applications. Systems planned were for document management with growing need for workflow automation. As expected, implementation of GIS was aimed at spatial data needs specific to particular functions of the organizations interviewed. All responding agencies cited the need for document imaging in future applications. Half the agencies will require GIS solutions for future applications.

D**Integration With Current Operations and Legacy Systems**

To determine how imaging applications are or will be implemented into the current operations of the agency, respondents were asked, *"How will the use of new imaging technology integrate with existing systems and operations?"*

1. not at all—will be separate
2. will integrate with existing systems
3. will replace existing systems

Exhibit III-5 summarizes the responses. (Multiple responses were allowed).

Exhibit III-5

Integration of Imaging Applications with Legacy Systems

Integration of Imaging Applications with Legacy Systems	Percent of Respondents
Separate Implementation	29
Will Integrate With Existing Systems	79
Will Replace Existing Systems	7

Number of responding agencies = 14

The desire to integrate imaging applications focused on the use of data in other functions and even by other organizations. Where integration with existing systems was not desired, it was because the legacy system was being replaced by the new system. The intensity of the integration with existing systems choice was high in several agencies.

E**Importance of Open Systems for Imaging Implementation**

To determine the degree to which open systems advantages are influencing imaging implementations, respondents were asked, *"How important are open systems principles to your imaging projects?"*

Responses are shown in Exhibit III-6 below.

Exhibit III-6

Significance of Open Systems Principles For Imaging Applications

Degree of Importance/Applicability of Open Systems Principles	Percent of Respondents
Required	43
Very Important	43
Somewhat Important	7
Not Important	7

Number of responding agencies = 14

That open systems principles were applicable was a dominant view. Respondents understood that integration of their imaging applications with other systems would be dependent on the "openness" of their imaging solution. Respondents who took the opposite view—that their application was a separate island of automation—considered connecting their application with other systems unnecessary. The agencies with little or no concern for openness identified minimal current use, but they stated that requirements for document management would increase for future applications.

F

Expected and Realized Benefits

When asked, "*What benefits do you expect from the use of imaging technology?*" respondents replied as shown in Exhibit III-7 below. (Multiple responses were allowed).

Exhibit III-7

Expected Imaging Benefits

Expected Benefits	Percentage of Respondents
Efficiency in Workflow Operation	73
Enhanced Information Access (timeliness, concurrent use)	73
Cost Savings (space, staff)	40
Better Information Security (document control, accountability)	40
Elimination of Other Systems (e.g., Document Tracking)	27
Improved Information Quality (accuracy, longevity)	13

Number of responding agencies = 15

Expectations relating to workflow efficiencies and information availability ranked highest. Cost savings and better document control were also frequently cited. Agencies with little or no experience with imaging applications expressed the same distribution of expectations as those with experience.

To determine how the respondents felt about the realized versus expected advantages, respondents were asked, *"What benefits have you actually realized from the use of imaging technology?"*.

Survey responses are shown in Exhibit III-8 below. (Multiple responses were allowed).

Exhibit III-8

Experienced Imaging Benefits

Experienced Benefits	Percent of Respondents
Enhanced Information Access (timeliness, concurrent use)	83
Efficiency in Workflow Operation	63
Cost Savings (space, staff)	50
Better Information Security (document control, accountability)	25

Number of responding agencies = 8

Consistent with the benefits expected, the responses related to enhanced information access and workflow efficiencies rated high. Actual cost savings related to storage space for displaced paper and associated staff were cited in only half the cases. The only agency expecting information security reported that it actually occurred. In general, agencies actually experience the benefits they expect. In only one case were productivity gains not as high as expected, although gains were experienced.

G

Expected and Experienced Disadvantages

When asked, *"What disadvantages do you expect or have you experienced using imaging technology?"* respondents replied as shown in Exhibits III-9 and III-10 below. (Multiple responses were allowed).

Exhibit III-9

Expected Imaging Disadvantages

Expected Disadvantages	Percent of Respondents
Cost	27
Expanded Infrastructure Requirement (technical support, quality control)	27
Expanded Operational Needs (storage capacity, platform size)	27
Reduced Speed of Operation (information access)	20
User Acceptance	7

Number of responding agencies = 15

There were no leading concerns about imaging applications. Each category was represented almost equally but with low frequency. Several respondents citing cost categorized it as a start-up rather than an ongoing issue. Adapting to use of an electronic image versus a paper document was typically cited as a user acceptance concern rather than a hard issue. (Multiple responses were allowed).

Exhibit III-10

Experienced Imaging Disadvantages

Experienced Disadvantages	Percentage of Respondents
Reduced Access to Information	38
User Training Requirements	25
Start-up Cost	25
Lack of Extensive Retrieval Tools	13
Quality of Image	13

Number of responding agencies = 8

All agencies interviewed anticipated disadvantages of using imaging. Exhibit III-10 identifies disadvantages actually experienced by the agencies that had implemented imaging. In only one case (limited access to information due to lack of system

capacity) were expected disadvantages experienced. All other experienced disadvantages were unanticipated. Image quality and lack of tools were characteristics of a system implemented three years ago. The cost report was for document conversion.

Experienced disadvantages did not focus on any particular issue. The negative experience cited with image quality and tools was with technology implementations from several years preceding.

H

Critical Success Factors

When asked, *"What are critical success factors in implementing imaging applications?"* respondents replied as shown in Exhibit III-11 below. (Multiple responses were allowed).

Exhibit III-11

Critical Successful Factors

Critical Success Factors for Imaging Systems	Percent of Responses
Ease of Use/Access	23
Cost Benefit	20
Technology Support	20
Training and Support	14
Availability of Standards	14
Storage Space Savings	11
Security of Documents	6

Number of responses = 35

No one factor was viewed as singularly significant to the success of imaging projects among the 14 agencies responding to this question, although technology infrastructure supported was rated highest. This comments on agency support requirements as much as on vendor support. A cost/benefit case was identified along with user concerns for ease of use and adequate training and support. These are related more to vendor issues. The remaining responses covered an array of factors, with no particular concentration.

I

Obstacles to Implementing Imaging Systems

Interviewees were asked, "*What are the obstacles to be overcome in implementing imaging systems?*" As opposed to the question regarding critical success factors that queried what would be the indicators of success, the purpose of this question was to determine factors in the current environment that were seen as problems or obstacles to imaging implementation.

Respondents replied as shown in Exhibit III-12 below. (Multiple responses were allowed).

Exhibit III-12

Imaging Obstacles

Obstacles to Imaging Direction	Percent of Responses
User Acceptance and Training	35
Cost of Implementation	26
Network Capabilities	17
Top Management Commitment	9
Document Security	4
Standards Availability and Adherence	4

Number of responses = 23

User acceptance and training needs were cited most often as obstacles to successful implementation. Concern for cost was highly correlated with cost as a critical success factor. Network and other technology support capabilities relating to bandwidth and storage were recognized as limiting factors in achieving full access and sharing.

In general, obstacles correlated highly with critical success factors. Agencies tend to measure success based on overcoming obstacles rather than absolute values in an application.

J

Source of Staffing Support

To determine vendor support requirements, respondents were asked, *"For your imaging projects, in what activities will your organization need vendor staffing support?"*

The responses are shown in Exhibit III-13 below, ordered by life cycle activity.

Exhibit III-13

Vendor Staffing Needs

Activity	Percent of Respondents
Technology Selection	53
Integration	47
Development	40
Operation	40
Application Design and Technical Specification	33
Application Assessment	27
Training	20

Number of responding agencies = 15

These responses indicate that generally half the support for imaging projects would be vendor supplied. These percentages are better understood from a particular agency perspective, because as a general rule, some agencies rely heavily on vendor support while other agencies rely almost exclusively on support by in-house staff. Training is an understated requirement. It was listed as a critical success factor (Exhibit III-11). Sensitivity to training needs appears to be an afterthought when asking for vendor requirements. Agencies that had identified need for training as an obstacle did identify vendors as a source of training and support. Agencies are not prepared to offer training themselves.

K**Use of Commercial Off-The-Shelf Software**

The responses to the question, *"To what degree will commercial off-the-shelf software be used to implement imaging systems?"* are shown in Exhibit III-14 below.

Exhibit III-14

Use of COTS

Intended Use of Commercial Off-The-Shelf Software	Percent of Respondents
Definitely	64
Probably	36
Possibly Not	0
Definitely Not	0
Not Sure	0

Number of responding agencies = 14

All of the respondents felt it was at least probable, if not definite, that they would make use of off-the-shelf software. Cost control and need for integration were driving issues toward COTS implementation. One respondent indicated a concern that COTS might not be appropriate for the agency's integration needs, but cost was an overwhelming concern.

L**Types of Platforms Used**

The responses to the question, *"What current and future platform type(s) support/will support imaging system operations in your agency?"* are shown in Exhibit III-15 below. Respondents were allowed to cite multiple types.

Exhibit III-15

Operational Platform Type

Platform Type	Current Applications	Future Applications
Enterprise	1	7
Department (LAN)	6	12
Desktop (PC)	8	9

Number of agencies = 15

Many respondents indicated current use of the desktop or department server as their operational platform, but there was a clear supposition that applications or portions of applications would migrate or evolve to an enterprise capability. Migration to departmentwide or enterprisewide status appears incremental. No respondent indicated a growth from desktop to enterprisewide. The scope of all applications is expected to grow over the next five years. Only one of the agencies currently without an imaging application expects to begin with a desktop scope. Departmental LANs will be starting points. This migration anticipation is consistent with the increasing implementation of client/server architecture.

M**Imaging Funding Trend**

Responses to the question, *"In your agency, at what rate are expenditures for imaging technology increasing and how do you expect this rate of change to vary in the future?"* are shown in Exhibit III-16 below.

Exhibit III-16

Information Technology Funding

Imaging Funding Increases	Respondents Cited Change Will Be:		
	Low	Moderate	High
Presently	9	5	0
Next 2-3 Years	3	8	3
Beyond 3 Years	1	9	4

Number of responding agencies = 14

These responses show that the projected funding for imaging implementations is expected to grow over the next several years. Respondents believe that funding levels will increase relative to current levels. A near-term spike may push spending levels higher, but in the long term, some respondents doubt that high levels will continue. Growing cost of technology and increasing budget pressures may limit both spending and capabilities. No agency believes funding rates will be reduced.

N**Other Factors Influencing Use of Imaging Technology**

To gain insight on factors that will affect the use of imaging, the question *"What other considerations do you feel are relevant to the use of imaging technology in the federal government in the next five years?"* was posed.

Responses are shown in Exhibit III-17 below. (Multiple responses were allowed).

Exhibit III-17

Factors Influencing Imaging Use

Influencing Factors	Number of Responses
Integration of other technologies with imaging	9
Maturation of imaging technology	7
Acceptance of user technologies	7
Client/server networks/Connectivity between agencies	6
Decreasing cost of technology	5
Accessibility of imaged information	5
Availability of standards	4
Evolution to open systems	2
Successful implementations	2

Number of responding agencies = 12

Many of the factors cited were technology issues. In general, imaging technology was viewed as part of a future technology picture with interconnectivity and information sharing as operating characteristics of federal organizations. Of the 36 factors identified, 22 were related to technology. User acceptance accounted for only nine of the 36 factors. Cost was cited as a factor by only four of the agencies. One agency stated that uncertainty regarding technology evolution, user requirements, and budget stability prevented a useful projection of influencing factors.



Profiles

The application of imaging technology in two agencies was reviewed in some detail to gain a better understanding of the benefits achieved and the obstacles overcome. The agencies interviewed for these profiles represent two extremes of imaging technology. The purpose of these studies was to determine additional information on:

- Each agency's current and planned use of imaging technology
- The scope and significance of imaging applications relative to overall information systems activity
- The use of imaging technology to support efforts to re-engineer the business
- The integration of imaging systems with legacy operations
- The extent to which open systems principles are affecting the implementation of imaging technology
- The expected and experienced benefits and disadvantages of using imaging technology
- The expected and experienced disadvantages of using imaging technology
- The types of platforms in use and planned to support imaging systems

A summary of the information obtained is provided below.

A

Department of Energy

1. Background

The mission of the Department of Energy is to develop and administer the nation's energy policies. The operations of the Department are highly decentralized. The technology planning reviewed was limited to the support of the headquarters' functions.

2. Significance of Imaging Use

At the headquarters level, the Department has begun to develop imaging systems to support information management in the form of document control systems. The technology plan of the Department is to make use of imaging to support and augment its office systems by facilitating the exchange of information associated with various administrative support systems.

3. Imaging In Support of Agency Re-engineering

Although the imaging initiatives were not part of the re-engineering of Department functions, there was a vision of the desktop as a unifying framework and an assumption that imaging would be part of the networked structure.

4. Integration With Legacy Systems

Imaging initiatives are being undertaken to better manage existing paper-based processes with nominal interface with existing automated systems. Therefore, target applications will be separate processes, and although these applications will be networked into the Department desktop architecture, they will not be interfaced to other application areas.

5. Open Systems Relationship

Although there was no necessity for interoperability from the perspective of the applications being developed, the Department recognizes the need to develop its applications using technology consistent with an overall technology plan and implemented

using a client/server architecture. In this regard, the Department is seeking to have a consistent, coherent architecture for its desktop applications and technical environment.

6. Benefits Obtained

At the time of the interview, the Department had not implemented any of the target applications.

7. Disadvantages Experienced

Disadvantages, too, are not yet relevant.

8. Supporting Technology

Desktop PCs are the basis of the Department's technical infrastructure. Essentially all employees are equipped with PCs, 75% of which have been upgraded to 486s over the last several years.

The Department views its needs as mainstream and intends to use commercial off-the-shelf products in conjunction with vendor technical support.

B

U.S. Forest Service

1. Background

The U.S. Forest Service is an agency of the Department of Agriculture. The mission of the Forest Service is to facilitate the use and conservation of the nation's natural forest resources.

2. Significance of Imaging Usage

The use of imaging technology at the Forest Service supports the monitoring of forest resources by airborne and satellite surveillance systems.

3. Imaging In Support of Agency Re-engineering

Imaging is a well-established technology for the creation and maintenance of the GIS applications supporting forest management. At present, imaging is not viewed as significant to re-engineering the agency's operations.

4. Integration With Legacy Systems

Imaging has developed as a cost-effective means to collect data; therefore, it is necessary to the monitoring of forest resources. Imaging has rendered early physical field measurement systems obsolete and is now fully integrated with the agency's collection, analysis and distribution functions.

5. Open Systems Relationship

Not only is imaging integrated into the systems supporting the Service, it is also integral to the sharing of information with other agencies and departments. Data sharing is done on a rudimentary basis using file transport mechanisms. As a matter of convenience and efficiency, these utility processes are satisfactory because the purpose of data sharing here is to eliminate redundant collection activities rather than share derived information.

6. Benefits Obtained

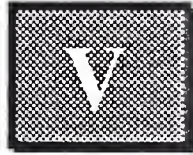
Image-based data collection and maintenance of various GIS applications using aerial and satellite videography has proven more cost effective than field measurement techniques.

7. Disadvantages Experienced

Additional standards and conventions are needed, especially as they relate to data representation.

8. Supporting Technology

Present technology is PC based. A procurement by the agency envisions acquisition of commercial off-the-shelf software and the use of networked PC platforms.



Findings and Recommendations

The findings of this survey indicate that imaging is recognized as a viable technology in a growing number of application areas of the federal sector. The experience and benefits gained to date by federal IRM executives validates their expectation of improved economy of operations based on cost reduction in labor and storage expenses. Imaging is viewed as a way to fundamentally change paper-intensive operations, increasing timeliness and availability of information.

The survey identified several instances of the use of imaging to support the re-engineering of agency functions. In this regard, imaging technology is generally viewed as a means of re-engineering operations to support the goals of the National Performance Review and the re-invention of government.

A

General Observations

As reported in the survey findings and noted above, the potential for cost savings is an important motivator for the IRM executive to implement imaging technology. However, the need for workflow improvement was cited most frequently as motivation for instigating imaging technology.

Another significant motivator is the re-invention of government operations as articulated by the National Performance Review initiative. This motivator corresponds to the interest in business process re-engineering that is so popular in the private sector. These motivating factors are discussed in more detail in the following sections.

The survey findings show that obstacles to imaging include concerns about user acceptance, implementation costs and, to a lesser degree, management commitment. The significant technical issue noted was related to network capacity to transmit imaged information. Perceived disadvantages cover a spectrum of concerns, from cost to user acceptance of an electronic versus paper record of information. The need for start-up and ongoing technical support was also recognized as a concern.

The survey sought to determine what factors the agencies felt were obstacles, at least in their particular organizations, to a successful imaging implementation. User acceptance and implementation costs were the most frequently cited obstacles.

Findings related to the critical success factors show technology support to be the most significant critical success factor. Imaging implementation must deliver significant cost reductions. Ease of use and sufficient training were also cited as critical to successful implementation.

Other findings of the survey indicated that:

- The potential use of imaging technology was not limited to particular functional areas; the use of imaging to support document storage and retrieval was considered the primary application.
- There is substantial interest in workflow management systems to integrate document management and process automation; GIS applications were viewed as very significant but applicable only to specialized needs.
- Integration with existing systems was not considered an issue because potential applications were viewed as automating a standalone or front-end process.
- Relative to data sharing and bandwidth requirements, integration and support by current networks was viewed as an issue.
- Open systems principles for imaging implementations were the dominant view; commercial off-the-shelf hardware and software components were a probable requirement of all agencies surveyed.

B

Recommendations

Individual findings and recommendations relative to the more significant needs and issues identified by the survey are cited below.

- **Funding Trends**

Finding:

Relative to funding levels, respondents indicated an accelerating rate of change to fund imaging implementations. The combined current moderate and high levels of funding total only 10%. Within the next three years, the comparable total is estimated to be at 60% and increasing thereafter to 80%.

Recommendation:

Relative to total information technology budgets, funding for imaging implementations will continue to increase. Although this technology area provides opportunity, it should also be recognized that competitive solutions must be based on open systems principles and provide off-the-shelf software solutions.

- **Cost/Benefit Focus**

Finding:

Findings relative to benefits, obstacles and critical success factors centered on the need for clear cost/benefit and economic payback justification.

Recommendation:

Potential projects must be sized and scoped to clearly define objectives, deliverables and time-tables. Project benefits and costs must articulate a compelling "business" case and must receive ongoing focus throughout project execution.

- **Platform Requirements**

Finding:

The prevalent view of platform needs for imaging systems would be satisfied by a personal computer or department server capability. Further, this platform was frequently considered as integrated into the enterprise through its network, facilitating data access and interchange.

Recommendation:

Imaging solutions must focus on the capabilities of the desktop platform as an imaging workstation and/or department server. Platform components of imaging solutions must be open and integratable into the enterprise's network and communications architecture to facilitate data sharing.

- **Software Requirements**

Finding:

Responses cited the need for vendor-supplied software as a component of imaging solutions. The majority of respondents felt that they would use commercial off-the-shelf software to reduce development and ongoing maintenance costs.

Recommendation:

Imaging solutions must incorporate open software components. Vendors whose software offerings are commercially available off-the-shelf products will have a competitive advantage.

- **Need for Management Education and Support**

Finding:

Imaging implementations must be cost effective, producing demonstrable economies. To be successful, implementations must address user needs, must conserve computing and network resources, and must be implemented using open principles. Involvement of

program and technical management relative to implementation and ongoing support needs is critical to setting and managing expectations and to project success.

Recommendation:

Program and technical management must be educated about imaging issues and solutions. Management and user involvement throughout project execution is necessary to resolve implementation issues and to address operational and technical support needs.

- **Other External Support Needs**

Finding:

Respondents recognized that imaging implementations require specialized capabilities related to operational platforms, software and supporting skills. The majority of the agencies interviewed felt they would need vendor support in both technology and staffing matters.

Other needs identified by the survey, such as standards and training, and the importance of vendor selection and support, further illustrate agency dependence on external resources.

Recommendation:

Vendors should provide a full array of support capabilities, including front-end applications consulting, project management expertise, training and ongoing technical support.

(Blank)



Market Forecast

As the results of this survey show, the use of imaging in the federal IRM marketplace is viewed as a primary strategy for responding to program demands and economic dynamics that drive agency operation. The forecasts presented below provide an overview of the federal imaging market over the next five years and show how imaging technology will command an increasing share of the overall IT market.

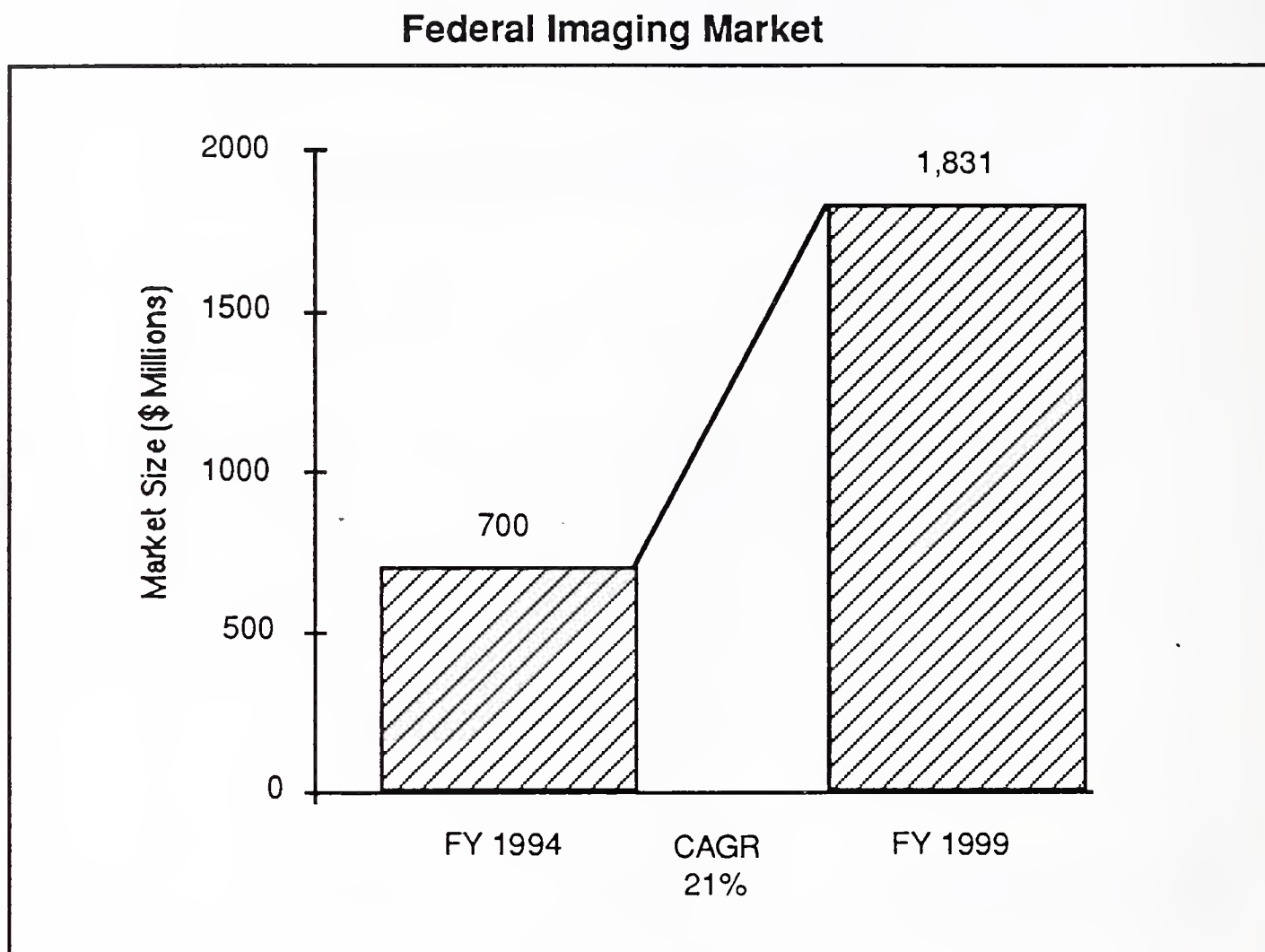
A

Market Projections

Industrywide, the projected expenditure for imaging technology is overwhelming. From a total market size of \$2.5 billion in 1993, INPUT projects that imaging will become a \$27 billion market by the year 2003. About one-sixth, or \$4.5 billion, will be in the federal sector by the end of this ten-year period. Imaging hardware accounts for almost 53% of this market in 1994, but will account for only 47% of imaging costs in the year 2003. Professional services requirements will increase over this period.

Use of imaging technology in the federal sector will gain an increasing share of federal IT expenditures. At about \$700 million in FY 1994, imaging represented 3% of the overall federal information technology budget. It is estimated that this market will exceed \$2 billion—or 7% of the overall total—by FY 1999. As shown in the projections of total federal expenditures provided in Exhibit VI-1, by FY 1999 imaging expenditures in federal agencies will exceed \$1.8 billion. Defense agencies will account for approximately \$700 million; civilian agencies will account for the major, remaining portion.

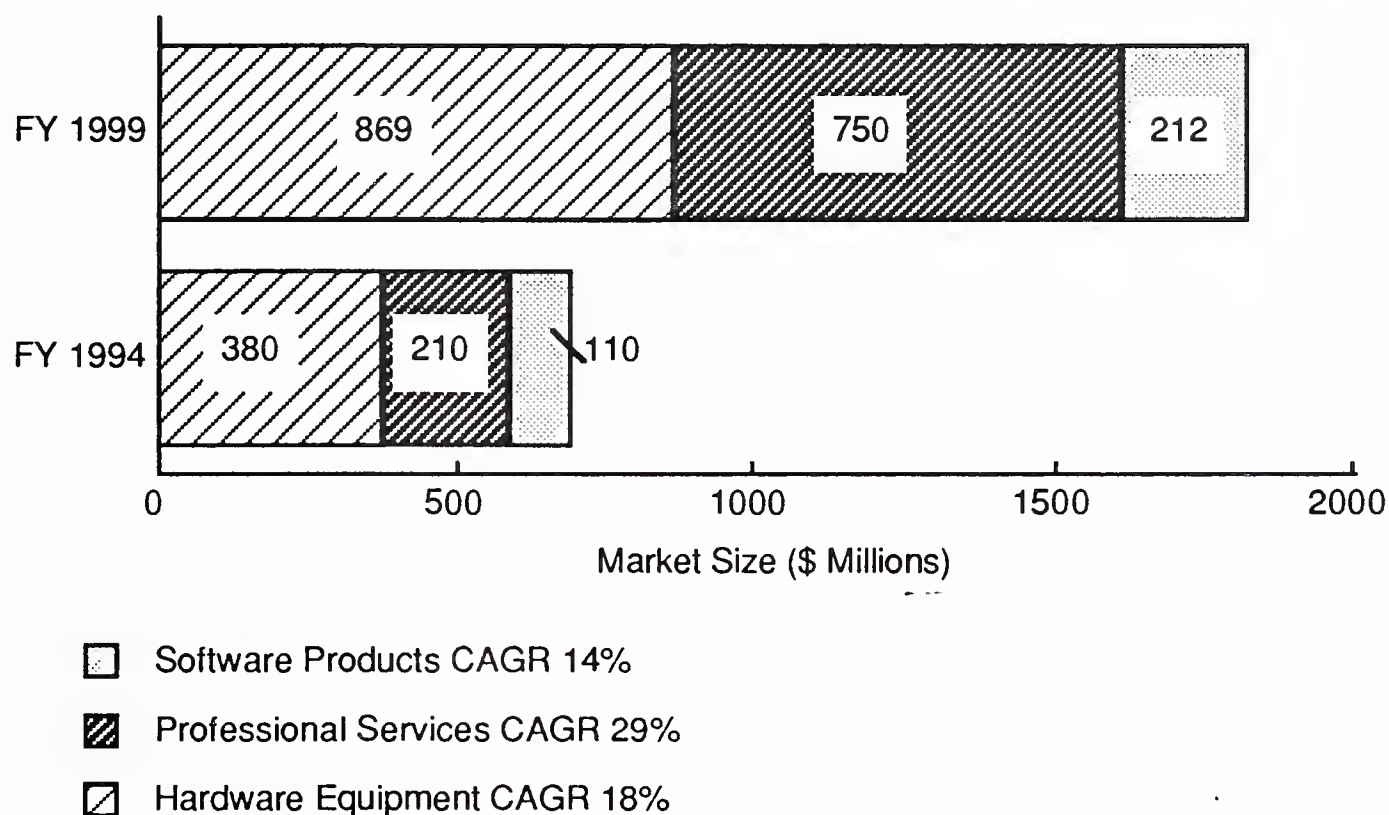
Exhibit VI-1



The primary submodes in the imaging market are software products, professional services and hardware equipment. Exhibit VI-2 breaks out the total market in these submode categories. While all modes in this market will grow at attractive rates as forecast for the next five years, the growth in professional services makes it the most attractive mode.

Exhibit VI-2

Imaging Market Submodes



The imaging market began with a distinct identity in the mid-1980s. Since then, the market has been driven primarily by hardware equipment. As the market matures, the hardware component will move toward commodity supply and overall proportional hardware costs will decline. At the same rate, professional services requirements will increase. This increase will be caused by advances in client/server architecture and the need to distribute image-based information across multiple platforms. Demands will also increase to integrate imaging with processing of other types of information. By the year 2003, imaging and graphic processing will achieve parity with more traditional processing types.

Systems integration will be the primary delivery mechanism for imaging solutions in the future. Imaging will become so pervasive that it will be difficult to separate the application from the total systems project. Imaging hardware accounts for half of the budget dollars today, but the market will increase its requirements for services related to total business engineering.

The principal market drivers for imaging integration are:

- Significant improvements in imaging hardware price/performance
- Greatly improved image interpretation software
- The emerging role of imaging as part of the business process engineering approach
- An increasing understanding of the proper roles of imaging in applications
- Many successful imaging projects

Exhibit VI-3 lists many of the major federal imaging systems integration projects.

Exhibit VI-3

Federal Imaging Systems Integration Projects

- Securities Exchange Commission Records
- IRS SCRIPTS and DPS
- FDA industry submissions
- Joint military EDMICS
- Joint services CALS
- Military personnel records
- Criminal information files (Secret Service)
- FBI fingerprinting applications
- Patent and trademark applications
- Weather service and environmental data
- Agency records management
- Social security inquiries
- Postal Service inquiry and tracking
- Forest Service resource planning

B**Imaging Vendors**

In the past, imaging vendors developed self-contained imaging components, both hardware and software. This focus on proprietary solutions limited the potential for these companies to integrate across system boundaries in a more open environment. Imaging integrators were non-existent. Today, there are only a few integrators in the federal imaging market. Exhibit VI-4 identifies the major federal imaging integrators in the early years of the market.

Exhibit VI-4

Federal Imaging Integrators

Vendor	Status
FileNet	Still provides proprietary hardware. Most of its business is in commercial markets.
Loral Corp.	(Formerly IBM) Inherited IBM's integration business, but still uses IBM's integration products.
Recognition Technology	Integration business is minimal. Mostly a supplier of imaging components.
TRW	Software is proprietary.
Unisys	Hardware is proprietary, but company continues to be a major integrator.
WANG	No longer a significant presence.

Source: INPUT

Exhibit VI-5 lists the major federal imaging integration vendors, ranked by total 1993 revenue.

Exhibit VI-5

**Federal Imaging Integration Vendors
(Ranked by Imaging Revenue in 1993)**

- | | |
|-----------|----------|
| • Grumman | • Unisys |
| • Harris | • CSC |
| • PRC | • EDS |
| • AT&T | • GTE |
| • IBM | • BDM |

Source: INPUT

VI-6 lists some of the imaging products available in federal imaging applications.

Exhibit VI-6

Representative Imaging Products

Vendor	Product
CSC	JCALS
DeLorme Publishing	MapExpert
ESRI	Arc/Info
Eradas, Inc.	Imagine
FileNet	WorkFlo
Genasys	GenaMap
Graphic Data Systems	GDS
Horizon Technology	Sure!MAPS
I Levy & Associates	Navigator 2000
IBM	ImagePlus
Intergraph Corp.	Modular GIS Environment
Loral Corp.	Integration Services
MapLinx Corp.	MapLinx
MapInfo Corp.	MapInfo
PRC	JEDMICS
Radian Corp.	CTS-3
Sigma Imaging Systems	OmniDesk
Software Publishing Corp.	Harvard Graphics
Strategic Mapping	Atlas GIS, Atlas MapMaker
Summit Software Corp.	Image Management System
Sylvan Ascent Software	DemoGraphX
TRW	Integration Services
ViewStar Corp.	ViewStar
WANG	WIIS

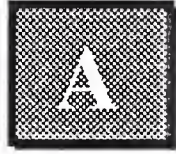
Integrators in the federal imaging market must deal with a number of different technology components. The greater the degree of differentiation within these components, the more specialized the integration approach. Naturally, the move toward open architecture suggests that more and more commodity products will be successful in federal imaging applications. However, each technology component presents a different profile of commodity versus differentiation. Exhibit VI-7 lists major technology components that are present in federal imaging applications and shows how INPUT thinks these components will vary between commoditization and differentiation over the next five years.

Exhibit VI-7

Degree of Differentiation in Imaging Technology

	1994	1999
Process engineering	Moderate	High
Workflow	Moderate	High
Camera-based imaging	Low	Commodity
Image engines	Moderate	Neutral
Image-tracking software	Moderate	Neutral
Image database software	Low	Commodity
Image-retrieval software	Moderate	Moderate
Physical interfaces	Moderate	Low
Software interfaces	Moderate	Moderate
Multimedia interfaces	Moderate	High
Object-oriented technology	Moderate	High
Global image management	Moderate	High
Integration/implementation	Moderate	High

Source: INPUT



Letter to Agency and List of Agencies Interviewed

January 12, 1994

Dear Government Official:

Thank you for your participation in INPUT's recent survey regarding Client/Server initiatives. We will forward a copy of the Executive Summary of the report to all agencies which participated.

As my earlier letter mentioned, we are also conducting research into the use of imaging technology by the federal government. Within the next few days, a senior research analyst will call your office to conduct a 15 minute telephone interview to collect information about the application of imaging technology in your agency. To acquaint you with the information desired, enclosed is the research questionnaire, which our analyst will complete from this interview. Further, if you are interested in having your agency's use of imaging technology included as a case study in our report, I have included a copy of the information we need from you. We are including this additional data in our report as a result of the interest in associated activities among your peers.

Please call or fax back the following pages to tell us who you want us to contact for this interview. Although our experience is that the dialogue of an interactive interview significantly enhances the quality of information gathered, we recognize your time constraints. Accordingly, if you prefer to complete and fax back the questionnaire, please do so.

We hope to complete the research for this report in the next two weeks and would appreciate your response as soon as possible. All information obtained by these surveys is confidential. Only

summary information is released to the public, and agency officials are not identified.

The feedback from you and your peers about our reports and information sharing has been very positive. If you have any ideas or suggestions regarding how our understanding of technology needs, issues or direction of the federal user community could be of use to you, please let me know.

In the meantime, thank you for your help and cooperation.

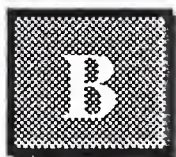
Sincerely,

Robert W. Deller, Ph.D.
Vice President

List of Participating Agencies

1. Department of Agriculture
Forest Service
Arlington, VA
2. Department of Commerce
National Oceanic and Atmospheric Administration
Silver Spring, MD
3. Department of Defense
Defense Information Systems Agency
Arlington, VA
4. Department of Energy
Headquarters (HR 431)
Washington, DC
5. Department of Energy
Los Alamos National Laboratory
Los Alamos, NM
6. Environmental Protection Agency
Imaging Program Office
Research Triangle Park, NC
7. Health and Human Services
Health Care Financing Administration
Baltimore, MD
8. Department of Interior
U.S. Geological Survey
Reston, VA
9. Department of Justice
Justice Management Division
Washington, DC
10. Department of Justice
Marshall's Service
Arlington, VA

11. Department of Labor
Information Systems
Washington, DC
12. Department of the Navy
NCSC
Washington, DC
13. Department of Transportation
OIRM
Washington, DC
14. Department of the Treasury
Internal Revenue Service
Arlington, VA
15. Department of the Treasury
U.S. Secret Service
Washington, DC



Questionnaire

Use of Imaging Technologies in the Federal Sector

Contact information for survey respondent

Agency: _____

Name: _____

Title: _____

Telephone: _____

Best day time to call: _____

Mailing address for your copy of the Imaging Technology Report—Executive Summary

Name: _____

Title: _____

Telephone: _____

Mailing Address: _____

Case information:

1. Description of agency mission as it relates to the imaging application
2. Project objective
3. Project description and related background information
4. Internal and external system linkages and interfaces
5. Project status and results to date
 - a. Benefits
 - b. Cost
6. Supporting vendors
7. Technologies utilized

Use of Imaging Technologies—Questionnaire

Organization:_____ Interviewee:_____ Date:_____

Survey Questions:

1. Is your organization currently using or planning to use imaging technology to support its operations?
 - A. No _____
 - B. Not yet, but planning to _____
(indicate how many projects within the next 2 years)
 - C. Currently using imaging technology to support how _____
many operations? _____
 - D. Have implemented imaging technology
 - for one application _____
 - for several (2-4) applications _____
 - for many (5 or more) applications _____
2. In what areas of your operation do you feel imaging technology will be used?
 - A. Applied to specific, narrow, specialized need(s) _____
 - B. Applied to broad functional/program needs _____
 - C. Applied to agency-wide functions _____
 - D. Applied to inter-agency data sharing activities _____
3. How is/will your organization use imaging technology?
 - A. As part of the reengineering functional areas and _____
associated new technology implementation
 - B. Support of functional area(s) with new technology _____
 - C. For new program initiatives only _____

4. What type(s) of imaging system are/will be useful to your organization?

	Are now	Will Be
Document Storage/Retrieval	_____	_____
Workflow	_____	_____
GIS	_____	_____
Other	_____	_____

5. How will the use of new imaging technology integrate with existing systems and operations?

- A. Not at all—separate implementation _____
- B. Will integrate with existing systems _____
- C. Will replace existing systems _____

6. In choosing imaging technology solutions, are open systems (scalable, extensible, interoperable, portable) important to your organization?

- A. Required _____
- B. Very important _____
- C. Somewhat important _____
- D. Not important _____

- 7a. Based on your organization's experience to date, what advantages do/did you anticipate and have you actually experienced?

Advantages anticipated:

1. _____
2. _____
3. _____
4. _____

Advantages experienced:

1. _____
2. _____
3. _____
4. _____

- 7b. Based on your organization's experience to date, what disadvantages do/did you anticipate and have you actually experienced?

Disadvantages anticipated:

1. _____
2. _____
3. _____
4. _____

Disadvantages experienced:

1. _____
2. _____
3. _____
4. _____

8. What are the critical success factors which must be addressed to successfully use imaging technology in future systems projects.

1. _____
2. _____
3. _____
4. _____

9. What obstacles do you feel must be overcome to successfully implement imaging technology supported operations?

1. _____

2. _____

3. _____

4. _____

10. In your imaging projects, in what activities will your organization need vendor support?

Application assessment _____

Technology selection _____

Application design and technical specification _____

Development _____

Integration _____

Operation _____

11. Do you expect to make use of commercial off-the-shelf systems (vs. custom designed and developed) for your imaging needs?

Definitely _____

Probably _____

Only possible _____

Probably not _____

Definitely not _____

12. What platforms are being/will be used to support your imaging operations?

	Used now	Will be
Enterprise	_____	_____
Department	_____	_____
Desktop	_____	_____

14. Relative to your present and planned technology initiatives, how is/will be the expenditure for imaging technology change? Indicate the rate of change by specifying **NONE** (zero or less), **LOW** (1-4%), **MODERATE** (4-7%), or **HIGH** (greater than 7%).

	<u>Rate of Change</u>			
Present	_____	_____	_____	_____
Next 2-3 years	_____	_____	_____	_____
Beyond 3 years	_____	_____	_____	_____

15. Over the next 5 years, what other considerations (problems, opportunities, trends, etc.) do you feel are relevant to the use of imaging technology in your agency? In the federal government?

1. _____
2. _____
3. _____
4. _____
5. _____

Thank you. Please make any additional comments below.

(Blank)

